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ABSTRACT

The relationships among the use of self-regulated learning strategies and two important cognitive motivational factors, expectancy of success and task value, were studied using hierarchical regression analysis. Since there are differences in self-regulated strategy use according to level of test anxiety, test anxiety was used as a control variable. In addition, multi-dimensional measures of self-regulated strategy use served as a multivariate dependent variable since effective self-regulation involves all three aspects of cognitive strategy use, metacognitive self-regulation, and resource management. It was hypothesized that: (1) students with a higher level of test anxiety would engage in less self-regulated strategy use than those with lower levels of test anxiety; (2) students who valued academic situations more would engage in greater self-regulated strategy use after test anxiety was held constant; and (3) students with a higher expectation of success will engage in greater levels of self-regulated strategy use after test anxiety and task value were held constant. Results from 88 undergraduates and 2 graduate students show that test anxiety explains a significant amount of variation in the set of the 3 dependent variables, although an examination of the univariate tests shows that test anxiety is only significantly related to resource management. Task value also explains a significant amount of variation in the three dependent variables after test anxiety is held constant. However, task value masks the effects of expectancy of success, so it shows no significant relationship to the multivariate set of dependent variables until it is entered before task value. Adding expectancy of success to the equation first, however, does not take away from the contribution that task value makes to the explanation of variation in the self-regulated strategy use set. An appendix gives the regression weights. (Contains 10 tables and 28 references.) (Author/SLD)

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Factors Underlying Cognitive Strategy Use

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Abstract

The purpose of this study is to examine the relationships among the use of self-regulated learning strategies and two important cognitive motivational factors, expectancy of success and task value using hierarchical regression analysis. Since there are differences in self-regulated strategy use according to level of test anxiety, test anxiety is used as a control variable in the present study. In addition, multi-dimensional measure of self-regulated strategy use serves as a multivariate dependent variable since effective self-regulation involves all three aspects, cognitive strategy use, metacognitive self-regulation, and resource management. Previous studies have focused mainly on cognitive strategy use alone. The three hypotheses are as follow: those students having a higher level of test anxiety will engage in less self-regulated strategy use than those with lower levels of test anxiety; those students who value academic situations more will engage in greater self-regulated strategy use after test anxiety has been held constant; and those students with a higher expectation of success will engage in greater levels of self-regulated strategy use after test anxiety and task value have been held constant. The participants were 88 undergraduate students and two graduate students from three institutions of higher education in Western New York and Northern Pennsylvania. It was found that test anxiety explains a significant amount of variation in the set of three dependent variables, although an examination of the univariate tests shows that test anxiety is only significantly related to resource management. Task value also explains a significant amount of variation in the three dependent variables after test anxiety is held constant. However, task value masks the effects of expectancy of success, so it shows no significant relationship to the multivariate set of dependent variables until it is entered before task value. Adding expectancy of success to the equation first, however, does not take away from the contribution that task value makes to the explanation of variation in the self-regulated strategy use set.

Factors Underlying Cognitive Strategy Use

In the last decade, educational researchers have begun to recognize that there is an important distinction between teaching strategies and learning strategies (Shuell, 1988). Learning strategies that are carried out by students are seen as being more important to academic achievement than teaching strategies, which are carried out by the teacher. It is these learning strategies which make the students active processors of information which, in turn, influences academic achievement (Pintrich, Garcia, McKeachie, & Lin, 1993). The purpose of this study is to examine the relationships among the use of self-regulated learning strategies and two important cognitive motivational factors, expectancy of success and task value. Test anxiety is also included in the present study as a control variable since much research shows that there are differences in self-regulated strategy use according to level of test anxiety (Benjamin, McKeachie, & Lin, 1987; Kirkland & Hollandsworth, 1979; Kleijn, van der Ploeg, & Topman, 1994; Naveh-Benjamin, McKeachie, Lin, & Holinger, 1981; Smith, Arnkoff, & Wright, 1990; Williams, 1996).

The Link Between Motivation and Strategy Use

Many studies have been carried out which show that strategy use, regulated by metacognition, is very important to academic achievement. This fact has important implications for education, especially since many of the differences between good and poor learners can be explained in terms of metacognitive awareness and strategy use. Research shows that learners at any age and ability level can be trained to be more metacognitively aware, and this awareness results in greater and more appropriate strategy use (Franks, Vye, Auble, Mezynski, Perfetto,Bransford, Stein, & Littlefield 1982; Owings, Petersen, Bransford, Morris, & Stein, 1980; Shuell, 1983; Stein, Bransford, Franks, Owings, Vye, & Mcgraw, 1982). More effort to educate students in metacognitive awareness and strategy use could result in smaller achievement differences between good and poor learners, bringing those considered to be poor learners closer to the achievement of good learners. However, motivation also plays a role. It seems that without sufficient motivation, metacognitive self-regulation and cognitive strategies will not be used.

Brown (1988) notes that most cognitive scientists have ignored motivational aspects of

learning. In her opinion, this needs to be rectified since the most effective learning occurs when the student is motivated, when there is a reason for learning, when the student wants to establish ownership of the knowledge, or when the student wants to incorporate new knowledge into existing knowledge. In most academic settings, students are usually forced to study in areas in which they have no interest. In such situations, they are not likely to monitor their own cognition or use strategies to facilitate their learning. Brown suggests that students need interactive learning environments to get them interested in the subject matter. Once the interest is there, the rest will be easier to accomplish.

Motivational Factors and Self-Regulated Strategy Use

Recent theories of motivation have stressed the idea that cognitive mediators are important to motivated behavior. Several important cognitive mediators have been identified which are important to motivation in academic settings: expectancy of success, task value, self-efficacy, attributions of success and failure, and motivational goal orientations (Petri, 1991). It is important to remember that these cognitive mediators are being used in achievement situations. In achievement situations, skill and effort are emphasized and luck is de-emphasized. Outcomes which are affected by luck involve a completely different set of rules regarding expectancy than do those that are affected by skill or effort (Weiner, 1985); therefore, the research on motivation in achievement settings may not be completely relevant to motivation on other settings and vice versa.

Researchers who have examined the relationship between learning and self-regulated strategy use have come to the conclusion that motivational factors are very important to strategy use (Ames & Archer, 1988; Brown, 1988; Diener & Dweck, 1978; Entwistle, 1988; Nolen, 1988; Pintrich & DeGroot, 1990; Tuckman, 1990). Both self-efficacy (Pintrich & DeGroot, 1990) and the perception that effort leads to success, or internal/unstable attributions, (Diener & Dweck, 1978) increase the likelihood of strategy use. In addition, the motivational goal orientation of the class setting and the individual student (i. e., mastery goals vs. performance goals) tends to influence what type of strategies are used and how effective this use is (Ames & Archer, 1988; Entwistle, 1990; Nolen, 1988; Tuckman, 1990).

Borkowski, Carr, & Pressley (1987) suggest that one aspect of metacognition, General Strategy Knowledge, has motivational properties and relates positively to self-esteem, an internal locus of causality, and constructive attributional beliefs about the causes of success and failure. These relationships are circular rather than unidirectional, however. Self-regulated strategic effort results in high self-esteem, an internal locus of control, and a tendency to attribute success to effort. These three things, in turn, result in continued self-regulated strategic effort. When someone lacks metacognitive knowledge, the lack is generally the result of a maladaptive attributional pattern that involves attributing success to external causes and failure to internal causes consistently. The acquisition and appropriate use of strategies is thus inhibited.

In another review of the literature, Entwistle (1988) also discusses the circular relationship of motivational factors to the use of strategic effort. He suggests that motivation is affected by the experiences of learning just as what is learned is influenced by motivation. He goes on to suggest that there must be an overall "game plan" that will aid students in translating skills into strategies. Three different approaches to learning are identified. First, there is the deep approach which involves the intention to understand. Some of the characteristics of this approach that Entwistle outlines are vigorous interaction with content, the relation of new ideas to previous knowledge, the relation of new concepts to everyday experience, the relation of evidence to conclusions, and an examination of the logic of the argument.

The second approach is the surface approach and represents the intention to complete task requirements. Some of the characteristics of this approach are the memorization of information needed for exams, the view that assignments are external impositions, unreflectiveness about purpose or strategies, focus on discrete ideas or facts without thought of integration, and failure to distinguish principles from examples. The third approach, the strategic approach, is concerned with the intention of receiving the highest possible grades. Characteristics of this approach are the gearing of work to the perceived preferences of teacher, awareness of grading criteria, systematic use of previous assignments and exam papers, the organization of time and effort to the greatest effect, and concern that there are the right conditions and materials for study. Some studies have

shown that perceived interest and relevance of course materials are related to the deep approach, while anxiety seems to push students toward a surface approach.

Along similar lines, Palmer and Goetz (1988) discuss the importance of the learner's beliefs to the use of learning strategies. They suggest that students who have low expectations, who are anxious and self-critical, who do not exert effort or persist in learning situations, and who attempt tasks in which strategies cannot possibly help are less likely to engage in effective strategy use. On the other hand, those who believe that they are capable of using strategies, in terms of ability and effort, will be more likely to use strategies. Early evidence to support this relationship between metacognitive self-regulation and motivation can be found in the Diener and Dweck (1978) study.

It seems that metacognitive awareness and knowledge of learning strategies are both important concepts, but the extent that these two factors will influence actual performance depends on the motivational pattern of a particular student. An individual's self-efficacy beliefs, attributional beliefs, and motivational goal orientation will influence the type of strategies that are used, the effectiveness of that strategy use, persistence at academic tasks, and, ultimately, academic achievement. Thus, there seems to be a very clear relationship between three of the cognitive mediators, self-efficacy, attributions of success and failure, and motivational goal orientation, and self-regulated strategy use. However, what is the relationship of expectancy of success and task value to self-regulated strategy use?

Little research has been performed to examine the relationships of either of these cognitive mediators with self-regulated strategy use. In 1983, Eccles proposed a model of achievement motivation that includes the over-arching concepts of expectancy of success and task value. Expectancy of success is an individual's expectation that they can engage in a particular task and complete it successfully. Since expectancy of success is actually developed from an individual's feelings of self-efficacy and their beliefs that they have control in a learning situation, the effect of expectancy of success on strategy use should be similar to the effects of self-efficacy and internal/unstable attributions on strategy use as has been identified previously (Diener & Dweck,

1978; Pintrich & DeGroot, 1990). In fact, it is possible that when self-efficacy and internal/unstable attributions are combined to create expectancy of success, the impact on self-regulated learning could actually be increased in a synergistic fashion, thus increasing the power to predict self-regulated strategy use when these two pieces of information are combined.

Task value is comprised of three characteristics (Eccles, 1983). First, a task has attainment value, which is the degree of importance that is placed on doing well on the task. Second, the intrinsic value of a task involves those aspects of a task that make it enjoyable in and of itself. Finally, the utility value of a task is the importance of the task for some future outcome (i.e., getting good grades so that one will be accepted into a good medical school). Since task value is related to an individual's interest in the subject matter, as well in learning the material for its own sake, task value should have a similar effect on strategy use as a mastery motivational goal orientation (Ames & Archer, 1988; Entwistle, 1988; Nolen, 1988).

Eccles and her associates have found support for this model of achievement motivation based on data collected from a sample of 668 students in grades five through twelve, their parents, and their teachers. The major conclusion of the study was that task value influences one's decisions about choosing activities in which to engage (i.e., math, science), while expectancy of success is the most important influence on performance once a task has been chosen. However, Eccles does not address the self-regulated use of strategies in the achievement of that performance nor how task value and expectancy of success relate to that self-regulated strategy use.

Pintrich (1989) has suggested that task value, whether attainment, intrinsic, or utility value, will encourage student interest in the task. This interest, in turn, will encourage a deep approach to learning in which the student will have an intention to understand, thus fostering the use of elaboration, organization, and critical thinking strategies. In terms of expectancy of success, Pintrich suggests that students who believe they can successfully perform a task will be more likely to monitor progress and adjust strategy use to achieve ultimate success. As a result, a high expectancy of success should result in high levels of metacognitive self-regulation which will, in turn, influence strategy use.

Test Anxiety and Self-Regulated Strategy Use

Test anxiety must be included as a control variable when examining self-regulated strategy use since an extensive amount of research has been done showing its relationship to use of various strategies (Williams, 1996). For example, Kirkland and Hollandsworth (1979), Benjamin et al. (1981), Naveh-Benjamin et al. (1987), Smith et al. (1990), and Kleijn et al. (1994) have linked test anxiety with deficits in cognitive skills and/or poor study habits. Specifically, Benjamin et al. (1981) found that high test anxious students do better on selected-answer tests, which require more recognition and less recall, than on supplied-answer tests, which require recall rather than recognition. In addition, the high test anxious students report problems with learning that go beyond simple problems with recall: they do poorly on take-home exams where no recall is required; they have difficulty identifying key points in course information nd materials; and the use more superficial cognitive strategies (e.g., maintenance rehearsal) to encode course information.

This research shows some support for Entwistle's (1988) hypothesis. Entwistle has suggested that high levels of test anxiety lead students to adopt a surface approach to strategy use. These students worry more about performance and less about learning for its own sake. As a result, they focus on rehearsal strategies rather than more reflective elaboration and critical thinking strategies to help them get through the exams.

Naveh-Benjamin et al. (1987) expanded on the deficit model of test anxiety as proposed by Benjamin et al. (1981) by showing that high test anxious students also have difficulty organizing class materials for study. In addition, they distinguish between two types of test anxious students. First, there are students who seem to have retrieval-only problems -- they are capable of organizing course materials and encoding information but have difficulty recalling information in a testing situation. The second type of test anxious students are those who have difficulty with organization, encoding, and retrieval. Smith et al. (1990) have added attentional difficulties to the list of cognitive problems that this second type of test anxious student may encounter. Finally, Kleijn et al. (1994) found that high test anxious students have difficulty managing study time effectively.

In sum, it has been found that test anxious students have difficulty with several aspects of strategy use. First, they have difficulty focusing attention on key points, they have difficulty organizing course materials, and they encode information using more surface, or lower-level, strategies. In addition, these students have difficulty managing study time effectively. Finally, tests anxious students have difficulty retrieving information at the time of the test. However, not all test anxious students have difficulties in all areas.

Examining the Effects of Expectancy of Success and Task Value on Self-Regulated Strategy Use

The purpose of the present study is to further examine the relationships of expectancy of success and task value with self-regulated strategy use, as measured by three separate variables, cognitive strategy use, metacognitive self-regulation, and resource management. The purpose for including a multidimensional measure of self-regulated strategy use is that effective self-regulation involves all three aspects (Pintrich, Garcia, McKeachie, & Lin, 1993), and the majority of studies outlined above have focused only on cognitive strategy use. The three hypotheses concern the multivariate relationships of test anxiety (as a control variable), expectancy of success, and task value with three dimensions of self-regulated strategy use. It is hypothesized that those students having a higher level of test anxiety are expected to engage in less self-regulated strategy use than those with lower levels of test anxiety. The second hypothesis is that those who value academic situations more are expected to engage in greater self-regulated strategy use after test anxiety has been held constant. Finally, it is hypothesized that those students with a higher expectation of success are expected to engage in greater levels of self-regulated strategy use after test anxiety and task value have been held constant.

Method

Subjects

The participants were 88 undergraduate students and two graduate students from three institutions of higher education in Western New York and Northern Pennsylvania. Twenty-seven students were recruited from a large state university center; nineteen were recruited from a smaller state college; forty-four were recruited from a branch campus of a semi-private university system.

These three institutions were chosen based upon the ease of gaining access to subjects. The sample was a convenience sample; participants at each site were recruited with the help of faculty and/or staff at that campus.

In the total sample, there were twice as many women (60) as there were men (30). Seventy-six percent of the sample was white (68). The next highest percentage was for African American students (15.6% or 14). Asians were represented only at the University center where there were two, and Native Americans were represented only at the branch campus where there were five. Only one hispanic, from the university center, was involved in the study. The students at the university center were primarily upper-level students. The students from the other two campuses were primarily lower-level students.

The mean age for the total group was 23.16 (s = 6.23). Looking at the means for each of the schools separately, the highest mean age occurred at the university center (X = 25.96) followed by the branch campus (X = 22.90). The youngest group was found at the state college (X = 19.80). The mean grade point average for the total group was 2.90 (s = .42). Separately, the grade point average decreased monotonically from the university center (X = 3.34) to the state college (X = 3.03) to the branch campus (X = 2.57).

Materials

The materials used in the study consisted of a biographical information sheet and the Motivated Strategies for Learning Questionnaire (MSLQ). Age, educational experience, and academic achievement were reported on the biographic information sheet. Educational experience was a relative rating based on the academic level of the student: freshman, sophomore, junior, senior, graduate. Academic achievement was measured as self-reported GPA.

The Motivated Strategies for Learning Questionnaire was designed to objectively assess student motivation level as well as use of cognitive and metacognitive learning strategies as an evaluation instrument for a learning-to-learn class (Pintrich et al., 1991). The MSLQ is made up of eighty-one items which are divided into two main scales: motivation and learning strategies. The Motivation Scale is broken down into three value component subscales (Intrinsic Goal Orientation,

Extrinsic Goal Orientation, and Task Value), two Expectancy Component Subscales (Control-of-Learning Beliefs and Self-Efficacy for Learning and Performance), and the Test Anxiety Scale makes up the affective component. The Learning Strategies Scale is made up of five cognitive/metacognitive subscales (Rehearsal, Elaboration, Organization, Critical Thinking, and Metacognitive Self-Regulation) and four Resource Management Strategies Subscales (Time & Study Environment, Effort Regulation, Peer Learning, and Help Seeking). The instrument is a paper-and-pencil questionnaire in which students respond to items according to a seven point Likert-type scale. The instrument can be administered to large groups of students at the same time and is objectively scored. High scores for each of the scales indicate that the student is exhibiting more of the cognitions, emotions, or behaviors that each of the scales is trying to assess. For example, with the Control-of-Learning Beliefs scale, a higher score indicates that the individual sees the self as having more control over learning outcomes than external forces.

Table 1 shows the reliability coefficients (Cronbach's alpha) for each of the scales from the original Pintrich et al. (1991) validity study and in the present sample. Since the variables of interest in the present study are combined variables, several combined scales were developed. (Table 2 shows the reliability information for these scales.) First, Task Value was developed by combining Intrinsic Goal Orientation and Task Value, which are the two components of task value according to Pintrich (1989). The reliability of the new combined scale is .87, and this scale measures how much students value school, either for intrinsic or extrinsic reason, and the degree to which they are interested in learning for its own sake. Next, the Expectancy of Success Scale was developed by combining Self-Efficacy and Control of Learning Beliefs, which are the two components of expectancy of success according to Pintrich (1989). The reliability of the new combined scale is .91, and it measures the degree to which students believe they can be successful and the degree to which students believe they have control over learning outcomes. Third, the Cognitive Strategy Use Scale was a combination of the Rehearsal, Elaboration, Organization, and Critical Thinking Scales. These three scales represent cognitive strategies which contribute to the encoding and organization of course materials. The reliability of the combined scale is .88.

Finally, the Resource Management Scale was a combination of Time and Study Environment, Effort Regulation, Peer Learning, and Help Seeking. The rationale for combining these subscales was that Pintrich et al. (1991) had written the items to reflect the management of effort and non-cognitive, external learning processes. The reliability of this combined scale is .82. Metacognitive Self-Regulation and Test Anxiety were used in their original forms from the MSLQ.

Design

The three major hypotheses in the study were tested by performing a multivariate hierarchical regression analysis with three dependent variables, cognitive strategy use, metacognitive self-regulation, and resource management. The three motivation subscales, test anxiety, task value, and expectancy of success, were used as independent variables. Gender, age, and school attended were added first as control variables. School attended was used since it provides an unobtrusive measure of ability. In addition, age seems to be more related to self-regulated strategy use than grade level (Brown & Smiley, 1977, 1978), so age was included as a control variable in the analysis, while year in school was not.

Once all of the control variables were entered, test anxiety was added to the equation and the amount of additional variance accounted for in the multivariate set of dependent variables was calculated. Task value was added next, and expectancy of success was added on the final step. It was expected that as each of these three motivation variables was added on successive steps, there would be a significant increment in estimated R^2.

Results

In an initial analysis, one individual was found to be an outlier on all three of the dependent variables, cognitive strategy use (COG), metacognitive self-regulation (MSR), and resource management (RM). This individual was a nineteen-year-old male from the branch campus who had the highest score on the metacognitive self-regulation scale, but scores that were below the mean on the cognitive strategy use and resource management scale. In addition, this student had a test anxiety score that was higher than the mean, while his task value and expectancy of success scores were below the mean. Since these scores were not in the same pattern as with the majority

of the other people in this sample, this individual was not included in the major analyses.

The means and standard deviations of the remaining eighty-nine subjects for the three dependent variables and the three motivation scales are shown in Table 2. The correlation matrix of all of the variables in the analysis is shown in Table 3. The three dependent variables all have significant, positive correlations with each other, ranging from .59 to .77 ($p < .005$). Expectancy of success and task value also have significant, positive correlations with the three self-regulation scales, ranging from .49 to .56 ($p < .005$). Test anxiety, however, has negative, moderate correlations with the three self-regulation scales. These range from -.20 to -.38 ($p < .05$). This seems to suggest that the higher the student's test anxiety, the less likely he/she is to engage in any of the three aspects of self-regulated strategy use.

Task value and test anxiety have a negative correlation ($r = -.14$), which is not significant. However, the direction suggests a slight tendency for those students who highly value school to have lower test anxiety than those who value school less. Test anxiety and expectancy of success correlate significantly ($r = -.28$, $p < .05$), indicating that students have a greater expectancy of success have lower test anxiety than those who have lower expectations for success. Expectancy of success and task value are positively correlated ($r = .65$, $p < .005$), supporting past findings that valuing academic achievement more is associated with greater expectations of success.

Hierarchical Regression Analysis

The results of the hierarchical regression analysis are shown in Table 7. Since gender, age, and school attended are control variables and of no real interest to the present study, the results for these three variables are not discussed here. However, since gender and school attended are categorical variables and were dummy coded before they were entered into the regression equation, group means and effect sizes are shown in Tables 4-6. (For the gender dummy code, males were recoded as 1 and females were recoded as 0; for the school attended dummy codes, S1 was the university center coded 1 and all else coded 0, while S2 was the state college coded 1 and all else coded 0.)

The main hypotheses concern test anxiety, task value, and expectancy of success. Because

three hypothesis tests are made here, the alpha level for each of the three tests was chosen by using the Bonferoni Inequality. To maintain a familywise Type I error rate of .05, the probability of making a Type I error for each of the three hypotheses must be less than .0167 for it to be considered significant.

The results of the hierarchical regression analysis are shown in Table 7, while the proportion of variance accounted for in the set of dependent variables is shown in Table 8. The first hypothesis that test anxiety explains a significant amount of variation in the set of three dependent variables is supported ($F_{(3,81)}= 3.65$, $p = .0167$). However, an examination of the univariate tests shows that test anxiety is only significantly related to resource management ($F_{(1,83)}=8.29$, $p < .01$). Once gender, age, and school attended are held constant, test anxiety accounts for an additional 7.8 percent of the variation in resource management. The relationship is negative, indicating that those individuals with greater test anxiety are able to less effectively manage resources for learning, including study time and their own effort expenditure.

Task value explains a significant amount of variation in self-regulated strategy use, even after the control variables and test anxiety are held constant ($F_{(3,80)} = 14.3$, $p < .001$). Of the three dependent variables, task value is most related to resource management ($r = .49$, $F_{(1,82)} = 32.4$, $p < .001$). An additional 22.2 percent of the variation in resource management can be explained when task value is entered into the regression equation (see Table 12).

Task value is also related to cognitive strategy use ($r = .51$, $F_{(1,82)} = 27.8$, $p < .001$). When task value is added to the regression equation, an additional 21.3 percent of the variation in cognitive strategy use can be explained. There is a similar pattern in the relationship between task value and metacognitive self-regulation ($r = .51$, $F_{(1,82)} = 25.3$, $p < .001$). An additional 19.9 percent of the variation in metacognitive self-regulation can be explained when task value is added into the regression equation. With each of the variables in the multivariate set, about one fifth of its variation can be accounted for by task value when gender, age, school attended, and test anxiety are held constant. Based on the zero-order correlations of task value with the three dependent variables, which hold nothing constant, task value accounts for 24 percent of the variation in

resource management, 26 percent of the variation in cognitive strategy use, and 26 percent of the variation in metacognitive self-regulation.

Since all of the correlations between task value and the dependent variables are positive, higher levels of task value are related to greater use of cognitive strategies, greater metacognitive self-regulation, and greater management of educational resources. It seems that the more a student values his/her education, either for intrinsic *or* extrinsic reasons, the more likely they are to engage in self-regulated strategy use, even after variation related to gender, age, and school attended has been taken into consideration.

Adding expectancy of success to the hierarchical regression analysis does not add to the explainable variation in self-regulated strategy use over and above that explained by task value ($F_{(3,79)} = 2.0$, $p < .12$). The amount of additional variation in the three dependent variables that can be explained when expectancy of success is added to the equation is minimal: in cognitive strategy use, an additional 3.8 percent of variation is explained; in metacognitive self-regulation, an additional 3.85 percent of variation is explained; and in resource management, 1.8 percent of additional variation is explained.

The correlations of expectancy of success with the three self-regulated strategy use variables are quite high (with cognitive strategy use, r =.51; with metacognitive self-regulation, r = .51; and with resource management, r =.49). However, expectancy of success also correlates very highly with task value (r =.65). It could be possible that the overlap of these two variables is masking any impact that expectancy of success has on the variation in the multivariate set of dependent variables. To examine this relationship more closely, a second hierarchical regression analysis was performed. In this analysis, expectancy of success was entered into the equation following test anxiety but before task value, which was entered on the last step. (See Table 9 for the results. Table 10 shoes the proportion of variance accounted for when the variables are reordered.)

When expectancy of success is added to the equation before task value, it does result in a significant increment in the amount of variation that can be explained in the multivariate set of

dependent variables ($F_{(3,80)} = 11.3$, $p < .001$). The greatest impact of expectancy of success is for cognitive strategy use ($F_{(1,82)} = 26.1$, $p < .001$). The percent of additional variation that can be explained in cognitive strategy use when expectancy of success is added to the equation is 20.3 percent (see Table 10). Expectancy of success impacts metacognitive self-regulation and resource management about equally ($F_{(1,82)} = 22.5$, $p < .001$ and $F_{(1,82)} = 22.4$, $p < .001$, respectively). In metacognitive self-regulation, 18.2 percent of additional variation can be explained when expectancy of success is added to the equation. In resource management, 16.8 percent of additional variation can be explained.

All of the zero-order correlations of expectancy of success with the three dependent variables are positive. This indicates that as students' expectations of success increase, their use of cognitive strategies, their metacognitive self-regulation, and their effective management of resources also increases.

Even after adding expectancy of success first into the regression equation, task value still accounts for a significant amount of variation in the multivariate set of dependent variables ($F_{(3,79)} = 4.3$, $p < .001$). The greatest effect of task value is still for resource management, but the F-ratio is much smaller than it was when task value was added first ($F_{(1,81)} = 10.7$, $p < .001$). Task value explains an additional 7.2 percent of the variation in resource management after expectancy of success is taken into account (see Table 10). Task value also explains a significant amount of the variation in cognitive strategy use ($F_{(1,81)} = 6.7$, $p < .05$) and metacognitive self-regulation ($F_{(1,81)} = 6.4$, $p < .05$). Adding task value to the equation after expectancy of success accounts for an additional 4.8 percent of the variation in cognitive strategy use and an additional 4.9 percent of the variation in metacognitive self-regulation.

These results suggest that adding task value to the equation before expectancy of success masks the effects of expectancy of success. Adding expectancy of success to the equation first, however, does not take away from the contribution that task value makes to the explanation of variation in the self-regulated strategy use set. The regression weights and t statistics for the variables entered in this last analysis are tabled in the appendix.

Discussion

With the first ordering of variables in the first hierarchical regression analysis, only two of the hypotheses were supported. First, test anxiety does account for a task value does account for a significant amount of variation in self-regulated strategy use over and above that accounted for by gender, age, school attended, although test anxiety is most related to resource management. These findings support what previous researchers have suggested about the relationship of test anxiety and self-regulated strategy use, although the only significant relationship of the multivariate set involves resource management (Kleijn et al., 1994). It seems that students with high levels of test anxiety are less likely to manage the time and place of study, have difficulty monitoring and regulating their own effort, are less likely to engage in cooperative study with peers, and do not seek external assistance from peers or professors when having difficulty with course material.

Second, task value accounts for a significant amount of variation in self-regulated strategy use over and above that accounted for by gender, age, school attended, and test anxiety, and accounts for significant variation in all three of the strategy use variables. This finding goes beyond what previous researchers have found concerning task value (Ames & Archer, 1988; Brown, 1988; Nolen, 1988; Pintrich & DeGroot, 1990). These researchers have found that task value affects the student's approach/avoidance behavior toward achievement situations but it has less of an impact on actual strategy use within the achievement situation. The findings here suggest, however, that once the student is in an achievement situation, task value influences the degree to which students engage in self-regulated strategy use. The greatest impact of task value is on resource management, followed by cognitive strategy use, then metacognitive self-regulation. Moreover, controlling for task value nullifies any effects that expectancy of success might have on self-regulated strategy use.

Entering expectancy of success before task value in the regression equation does support previous findings that expectancy of success is related to strategy use once the student is involved in an achievement situation. In addition, the findings here are consistent with previous findings which indicate that high expectations of success lead to greater self-regulated strategy use in a type

of self-fulfilling prophecy (Ames & Archer, 1988; Brown, 1988; Nolen, 1988; Pintrich & DeGroot, 1990). In the present study, higher expectations of success are related to greater self-regulated strategy use: students who feel that they are likely to succeed tend to engage in greater cognitive strategy use, greater metacognitive self-regulation, and greater management of learning resources.

Limitations of the Study

There were several limitations in the present research. First, the sample was quite small and was taken from only one part of the country. Second, all of the variables in the study were measured by having the students involved respond to self-report likert scales. Although evidence has been presented which show that the combined scales which were used have acceptable levels of reliability, the jury is still out on the validity of such scales since they may not relate to what students actually do in an academic situation for a variety of reasons (e.g., fallibility of memory, social desirability, etc.).

Implications for Future Research

In spite of these limitations, the findings of the present study show that both expectancy of success and task value are important predictors of self-regulated strategy use. When doing research on strategy use, it is important to control for test anxiety due to its differential impact on various aspects of self-regulated strategy use (i.e., resource management). Future research should continue to examine methods of diminishing test anxiety, but should also look at ways that expectancy of success and task value can be increased so as to have a positive impact on self-regulated strategy use.

Implications for Education

As educators, we want students to engage in self-regulated strategy use. However, many of the programs attempting to teach self-regulated strategy use have inconsistent results. These findings suggest that such programs need to include a motivational component which will impact students' beliefs about their own competence and about the value of the task to ensure that students actually use the strategies they learn. In addition, the impact of test anxiety needs to be explored

further. Will programs which teach resource management strategies and include a motivational component help eliminate debilitating test anxiety or does test anxiety need to be eliminated so students will avoid surface strategies and attempt more strategies that help them understand the material rather than just memorize it? In any case, teachers at any level can attempt to include more strategy instruction within a particular subject area, as well as help students organize material and focus on key points, as a way to encourage self-regulated strategy use but also to decrease anxiety (Mealey & Host, 1992).

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Table 1

Motivated Strategies for Learning Questionnaire - Reliability and Validity of Scales

Scale	alpha	Mean	SD	Correlation with final grade
Motivation				
Intrinsic Goal Orientation	.74	5.03	1.09	.25
Extrinsic Goal Orientation	.62	5.03	1.23	.02
Task Value	.90	5.54	1.25	.22
Control of Learning Beliefs	.68	5.74	0.98	.13
Self-Efficacy for Learning and Performance	.93	5.47	1.14	.41
Test Anxiety	.80	3.63	1.45	-.27
Learning Strategies				
Rehearsal	.69	4.53	1.35	.05
Elaboration	.76	4.91	1.08	.22
Organization	.64	4.14	1.33	.17
Critical Thinking	.80	4.16	1.28	.15
Metacognitive Self-Regulation	.79	4.54	0.90	.30
Time & Study Environment	.76	4.87	1.05	.28
Effort Regulation	.69	5.25	1.10	.32
Peer Learning	.76	2.89	1.53	-.06
Help Seeking	.52	3.84	1.23	.02

Note. The data are from A Manual for the Use of the Motivated Strategies for Learning Questionnaire Pintrich et al., 1991, Ann Arbor: National Center for Research to Improve Postsecondary Learning and Teaching.

Table 2

Reliability, Means, and Standard Deviations of Scales Used in the Analysis (N=89)

Scale	alpha	Mean	SD
Expectancy of Success	.91	32.28	5.96
Task Value	.87	26.02	3.94
Test Anxiety	.80	20.53	7.46
Cognitive Strategy Use	.88	22.40	4.72
Metacognitive Self-Regulation	.79	55.40	11.93
Resource Management	.82	22.69	4.14

Table 3

Correlations of Variables

	Gen	S1	S2	Age	EXP	VAL	TA	COG	MSR	RM
Gen	1.00									
S1	.09	1.00								
S2	**-.22**	**-.34**	1.00							
Age	**.29**	**.27**	**-.26**	1.00						
EXP	-.09	.11	.01	**.20**	1.00					
VAL	.05	**.21**	-.12	.14	**.65**	1.00				
TA	.10	**-.41**	.06	**-.21**	**-.28**	-.14	1.00			
COG	.05	**.35**	-.12	**.26**	**.51**	**.54**	**-.21**	1.00		
MSR	-.05	**.23**	-.07	**.32**	**.51**	**.51**	**-.20**	**.77**	1.00	
RM	.16	**.33**	**-.18**	**.21**	**.49**	**.56**	**-.38**	**.59**	**.63**	1.00

Correlations significant at the .05 level are bolded.

Legend:

Gen -- gender dummy code with males recoded as 1 and females recoded as 0
S1 -- school attended dummy code with university center coded 1 and all else coded 0
S2 -- school attended dummy code with the state college coded 1 and all else coded 0
Age -- age of participants
EXP -- expectancy of success combined scale
VAL -- task value combined scale
TA -- test anxiety scale
COG -- cognitive strategy use combined score
MSR -- metacognitive self-regulation scale
RM -- resource management combined scale

Table 4

Gender Differences in Strategy Use

Variable	Total		Male Mean	Female Mean	Effect Size
	Mean	SD			
Cog	22.20	4.72	22.08	22.55	-.10
MSR	55.20	11.93	56.03	54.80	.10
RM	22.72	4.12	21.77	23.18	-.34

Table 5

University/State College Differences in Strategy Use

Variable	Total		University Mean	State College Mean	Effect Size
	Mean	SD			
Cog	22.20	4.72	24.89	21.36	.75
MSR	55.20	11.93	59.33	53.58	.48
RM	22.72	4.12	24.80	21.33	.84

Table 6

State College/Branch Campus Differences in Strategy Use

Variable	Total		State College Mean	Branch Campus Mean	Effect Size
	Mean	SD			
Cog	22.20	4.72	21.36	21.29	.01
MSR	55.20	11.93	53.58	53.33	.02
RM	22.72	4.12	21.33	22.02	-.17

Table 7

Hierarchical Regression Analysis

		Multivariate Tests		Univariate Tests		
Source	df	Likelihood Ratio	F (df)	COG (df)	MSR (df)	RM (df)
Gender	1	.93	2.13 (3,85)	.20 (1,87)	.20 (1,87)	2.30 (1,87)
Age, elim. Gender	1	.87	4.14** (3,84)	6.34* (1,86)	12.28*** (1,86)	2.81 (1,86)
School attended, elim. gender and age	2	.85	2.25* (6,164)	4.29* (2,84)	1.20 (2,84)	3.97* (2,84)
Test Anxiety, elim. previous variables	1	.88	3.65† (1,83)	.21 (1,83)	.32 (1,83)	8.29** (1,83)
Task Value, elim. previous variables	1	.65	14.31*** (3, 80)	27.84*** (1,82)	25.32*** (1,82)	32.44*** (1,82)
Expectancy of Success, elim.previous variables	1	.93	2.03 (3,79)	5.38* (1,81)	4.17* (1,81)	2.68 (1,81)
Residual	81		Mean Squares:	14.25	95.16	10.13

* $p < .05$ † $p < .0167$ ** $p < .01$ *** $p < .001$

Table 8

Proportion of Variance Accounted for in the Multivariate Set of Dependent Variables

Variable	COG	MSR	RM
Gender	.002	.002	.025
Age	.068	.124	.031
School	.086	.024	.081
Test Anxiety	.002	.003	.078
Task Value	.213	.199	.222
Expectancy of Success	.038	.032	.018
Total	.411	.385	.456

Table 9

Alternate Order Hierarchical Regression Analysis

		Multivariate Tests		Univariate Tests		
Source	df	Likelihood Ratio	F (df)	COG (df)	MSR (df)	RM (df)
Gender	1	.93	2.13 (3,85)	.20 (1,87)	.20 (1,87)	2.30 (1,87)
Age, elim. Gender	1	.87	4.14** (3,84)	6.34* (1,86)	12.28*** (1,86)	2.81 (1,86)
School attended, elim. gender and age	2	.85	2.25* (6,164)	4.29* (2,84)	1.20 (2,84)	3.97* (2,84)
Test Anxiety, elim. previous variables	1	.88	3.65† (1,83)	.21 (1,83)	.32 (1,83)	8.29** (1,83)
Expectancy of Success, elim. previous variables	1	.70	11.30*** (3, 80)	26.10*** (1,82)	22.50*** (1,82)	22.40*** (1,82)
Task Value, elim.previous variables	1	.86	4.30*** (3,79)	6.70* (1,81)	6.40* (1,81)	10.70* (1,81)
Residual	81		Mean Squares:	14.25	95.16	10.13

* $p < .05$ † $p < .0167$ ** $p < .01$ *** $p < .001$

Table 10

Proportion of Variance Accounted for in the Multivariate Set of Dependent Variables

Variable	COG	MSR	RM
Gender	.002	.002	.025
Age	.068	.124	.031
School	.086	.024	.081
Test Anxiety	.002	.003	.078
Expectancy of Success	.203	.182	.168
Task Value	.048	.049	.072
Total	.411	.385	.456

Appendix

Regression Weights

Variable	Cog			MSR			RM		
	ß	t	p	ß	t	p	ß	t	p
Gender	.05	.06	.96	-2.92	-1.22	.23	1.48	1.89	.07
Age	.08	1.19	.24	.43	2.55	.02	-.01	-.18	.86
School Attended:									
S1	2.57	2.47	.02	2.66	.99	.33	.98	1.11	.27
S2	.44	.41	.68	1.19	.42	.68	-.45	-.49	.63
Test Anxiety	.02	.31	.75	.02	.14	.90	-.14	-2.61	.02
Exp. of Success	.22	2.30	.03	.50	2.04	.05	.13	1.64	.11
Task Value	.36	2.58	.02	.91	2.54	.02	.38	3.27	.01